To Whomsoever It May Concern,

It is my pleasure to write this recommendation for Mr. Moses Prasad Varghese, an excellent student, and a bright young individual, for the PhD program at your venerable university. I have been associated with him as the mentor for his research project here at the Mechanical Engineering department of our institution for over 4 years. All through my twenty-four years of my teaching and research experience, I have taught thousands of students from varied backgrounds, different attitudes, and talents, but I would place Moses in the top bracket because of his sincerity, hard work, dedication, and aptitude for research. He was exceptional in his academics and consistently aced every evaluation and assessment. I observed him to be a team player who never hesitated to extend a helping hand to his peers, willingly assisting them with comprehending complex concepts and theories. He is well cut out for a higher degree at a top-level university like yours.

Moses is a highly focused and enthusiastic individual especially when it comes to the field of academic research. He has an inquisitive mind which always looks for an analytical reason, causalities, and interrelationships among the concepts of the subjects. He is highly organized, with amazing work ethics and methodical in his approach to his work, because of which he has completed all the stages of his project well within the stipulated deadlines. He is honest, committed to his work and he made sure that there was no compromise on the quality of his project even if it meant burning the midnight oil on some occasions. His inherent quality to be able to transform theoretical knowledge into the practical realm was quite evident throughout his research project titled 'Vibration Energy Harvester from a Piezoelectric Cantilever Beam'. He was required to implement his knowledge of structural dynamics to be able to achieve the required results. It involves one of the most complicated analytical methods called *Method of Multiple Scales* which entails 3^{rd} and 4^{th} order nonlinear variables coupled with multiple higher order time and spatial differential parameters which is used to solve the governing equation of the complex structural system analytically. Moses approached to solve the equation very meticulously having a flexible and adaptable mindset, first by understanding the problem statement followed by breaking down the complex equation to simpler 1^{st} and 2^{nd} order functions and identifying the patterns to derive from and then applying different mathematical tools such as discretization principles and Hamilton energy equations to reach the intended results. Additionally, since most of the concepts he encountered during the project were beyond the scope of his undergraduate education, he communicated with the researchers in this domain from the papers and made sure that he was on the right track, consulted with me regularly by sharing different approaches to solve the problem and took the initiative to collaborate with my PhD students to get more insight into the frameworks and to find the results and in turn help each other out in solving problems in the research which showed his eagerness to learn and expand his horizons.

Moses was not only able to complete the project within a very short time but was also accurate with all his calculations and methods. Moreover, he frequently asked intelligent questions in a bid to gain a firm grasp on the concepts. He possesses excellent technical knowledge of the core subjects which he supplements by keeping up to date with the latest advancements and technological innovations. Moses's logical aptitude in programming helped him to successfully build an application to demonstrate how the analytical results correlated with the simulated results. Here with data visualization in MATLAB, Fortran, and Simulink he meticulously chose data points based on the trends of higher output with various combination of position, velocity, force, energy, and time coupled with varying initial and boundary conditions to simulate the systems nonlinear behavior. His patience, perseverance, and attention to analytical detail helped him achieve successful results and his diligence and pragmatic analysis represent his competency towards research.

After completing his undergraduate studies, he assisted me in my research for a period of over two years. He would spend several hours each week completing the work given to him. Moses was always a regular and attentive student who took the initiative to clearly articulate and execute each problem in a systemic way. This clearly displayed a sense of responsibility, discipline, reliability, and a desire to excel- qualities that I hold in high regard. The undergraduate research project gave him foundational understanding on how to work through nonlinear ordinary and partial differential equations inferred from the newly developed dynamic system. He makes use of the literature behind the research work and puts in effort to try to understand the concept's referring to different books and research journals in detail and uses all available information to give me an excellent summary of the past work and valuable points for how to carry how the work to reach the intended result. Subsequently, with the help of one of my PhD students working in the same domain, he was able to publish an article in the Journal of Applied Acoustics titled 'Coupled non-linear behavior of beam with a moving mass'.

I have also come to appreciate his analytical capability and his eye for detail. He was able to quickly grasp difficult concepts, think critically and handle the rigor of a competitive college environment. Besides being a great

researcher, he has also displayed great interest in developing his leadership, communication, and project management skills. His cheerful nature and openness to feedback meant he is always learning and growing, an impressive strength that will continue to serve him well during college and beyond. He certainly has the determination and maturity to succeed in any endeavor and always maintains a positive attitude.

Considering all this, I firmly believe that he has all the prerequisite qualities and caliber to carry out meaningful research work under the guidance of a university faculty like yours. I am confident that, if given the opportunity to be a part of your program, Moses will prove to be an excellent academic, exceed expectations and go on to become an invaluable asset to your university. I hence strongly recommend him to your graduate program and wish him the best for his future.